

WHAT IS CLAIMED IS:

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1. A document reading apparatus comprising:
  - a light source for irradiating a document;
  - a linear image sensor for converting reflection light of the document into an electric signal;
  - 10 a light source drive controller that includes a pulse generating unit for generating a plurality of control pulses having a period that is shorter than an accumulation period of the linear image sensor, the accumulation period being indicated by a timing signal that represents the accumulation period and a non-accumulation period, and a synchronization output unit for outputting a prescribed number of trigger pulses that are in synchronization with the timing signal and the control pulses; and
  - 15 a light source driver that is arranged to drive the light source in response to the trigger pulses.
- 20 25 2. The document reading apparatus as claimed in claim 1,

wherein:

the synchronization output unit includes a counter that is arranged to start counting the control pulses when a level of the timing signal is switched to a level representing the  
5 accumulation period and to generate a count signal after counting the control pulses up to the prescribed number, and a gate for outputting trigger pulses that are in synchronization with the control pulses generated within a period from the time at which the counter starts counting the control pulses to the  
10 time at which the count signal is generated.

15       3. The document reading apparatus as claimed in claim 1,  
further comprising:

a light level designator that is arranged to detect a brightness of the light source and to adjust the brightness of the light source to fall within a prescribed brightness range  
20 by setting the prescribed number of trigger pulses to a value corresponding to the prescribed brightness range.

4. The document reading apparatus as claimed in claim 3,  
wherein:

the light level designator includes a standard white board  
that is arranged to be irradiated by the light source, the  
5 linear image sensor, which is arranged to read a white level of  
the standard white board, and a compensation unit that is  
arranged to determine whether or not the read white level of  
the standard white board is within the prescribed brightness  
range, and to update the value of the prescribed number when  
10 the read white level is above the prescribed brightness range,  
in which case the value is raised, and when the read white  
level is below the prescribed brightness range, in which case  
the value is lowered.

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5. The document reading apparatus as claimed in claim 1,  
wherein:

20 the pulse generating unit is a variable frequency pulse  
generating unit that is arranged to generate a plurality of  
control pulses having a frequency that is variable.

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6. The document reading apparatus as claimed in claim 5,  
wherein:

the synchronization output unit includes a gate that is  
5 arranged to start outputting the trigger pulses in  
synchronization with the control pulses generated by the  
variable frequency pulse generating unit when a level of the  
timing signal is switched to a level representing the  
accumulation period and to stop the outputting of the trigger  
10 pulses when the level of the timing signal is switched to a  
level representing the non-accumulation period.

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7. The document reading apparatus as claimed in claim 5,  
wherein:

the variable frequency pulse generating unit is arranged  
to generate a plurality of control pulses having a prescribed  
20 frequency and a period that is shorter than the accumulation  
period of the linear image sensor, the accumulation period  
being indicated by the timing signal that represents the  
accumulation period and the non-accumulation period; said  
document reading apparatus further comprising:

25 a light level designator that is arranged to detect a

brightness of the light source and to adjust the brightness of the light source to fall within a prescribed brightness range by setting the prescribed frequency to a value corresponding to the prescribed brightness range.

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8. The document reading apparatus as claimed in claim 7,  
10 wherein:

the light level designator includes a standard white board that is arranged to be irradiated by the light source, the linear image sensor, which is arranged to read a white level of the standard white board, and a compensation unit that is  
15 arranged to determine whether or not the read white level of the standard white board is within the prescribed brightness range, and to update a value of the prescribed frequency when the read white level is above the prescribed range, in which case the value is raised, and when the read white level is  
20 below the prescribed brightness range, in which case the value is lowered.

9. The document reading apparatus as claimed in claim 5,  
wherein:

the variable frequency pulse generating unit is arranged  
to generate a plurality of control pulses having a prescribed  
frequency and a period that is shorter than the accumulation  
period of the linear image sensor, the accumulation period  
being indicated by the timing signal that represents the  
accumulation period and the non-accumulation period; said  
document reading apparatus further comprising:

10 a light level designator that is arranged to detect a  
brightness of the light source and to adjust the brightness of  
the light source to fall within a prescribed brightness range  
by setting each of a value of the prescribed number of trigger  
pulses and a value of the prescribed frequency to correspond to  
15 the prescribed brightness range.

20 10. The document reading apparatus as claimed in claim 9,  
wherein:

the light level designator includes a standard white board  
that is arranged to be irradiated by the light source, the  
linear image sensor, which is arranged to read a white level of  
25 the standard white board, and a compensation unit that is

arranged to determine whether or not the read white level of  
the standard white board is within a brightness prescribed  
range, and to update the value of the prescribed number of  
trigger pulses and the value of the prescribed frequency when  
5 the read white level is above the prescribed brightness range,  
in which case the values are raised, and when the read white  
level range is below the prescribed brightness range, in which  
case the values are lowered.

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11. A document reading apparatus comprising:  
a light source for irradiating a document;  
15 a linear image sensor for converting reflection light of  
the document into an electric signal;  
light source drive control means including pulse  
generating means for generating a plurality of control pulses  
having a period that is shorter than an accumulation period of  
20 the linear image sensor, the accumulation period being  
indicated by a timing signal that represents the accumulation  
period and a non-accumulation period, and synchronization  
output means for outputting a prescribed number of trigger  
pulses that are in synchronization with the timing signal and  
25 the control pulses; and

light source driving means for driving the light source in response to the trigger pulses.

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12. The document reading apparatus as claimed in claim 11, wherein:

the synchronization output means includes a counter that  
10 is arranged to start counting the control pulses when a level  
of the timing signal is switched to a level representing the  
accumulation period and to generate a count signal after  
counting the control pulses up to the prescribed number, and  
gate means for outputting trigger pulses that are in  
15 synchronization with the control pulses generated within a  
period from the time at which the counter starts counting the  
control pulses to the time at which the count signal is  
generated.

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13. The document reading apparatus as claimed in claim 11,  
wherein:

25 the pulse generating means is a variable frequency pulse

generating means that is arranged to generate a plurality of control pulses having a frequency that is variable.

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14. The document reading apparatus as claimed in claim 13,  
wherein:

the synchronization output means includes gate means for  
10 outputting the trigger pulses in synchronization with the  
control pulses generated by the variable frequency pulse  
generating means when a level of the timing signal is switched  
to a level representing the accumulation period and for  
stopping the output of the trigger pulses when the level of the  
15 timing signal is switched to a level representing the non-  
accumulation period.

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15. The document reading apparatus as claimed in claim 11,  
further comprising:

a light level designating means for detecting a brightness  
of the light source and adjusting the brightness of the light  
25 source to fall within a prescribed brightness range by setting

at least one of a value of the prescribed number of trigger pulses and a value of a prescribed frequency of the control pulses to correspond to the prescribed brightness range.

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16. A document reading apparatus comprising:

a light source positioned parallel to one side of a  
10 document to irradiate light on the document, a positional relation between the document and the light source being mechanically changeable so that an irradiated area on the document moves along the other side of the document;

15 a linear image sensor arranged to convert a reflected light from the document into an electrical signal corresponding to the intensity of the reflected light of the document, and to output the electric signal; and

20 a light source drive circuit arranged to control an on/off time of the light source to be shorter than a time obtained from dividing an accumulation period of the linear image sensor by a value m ( $m > 1$ ) in order to alter an exposure light level of the linear image sensor.

17. A document reading apparatus comprising:

a light source positioned parallel to one side of a  
document and being driven by high voltage high frequency pulses  
5 to irradiate light on the document, a positional relation  
between the document and the light source being mechanically  
changeable so that an irradiated area on the document moves  
along the other side of the document;

10 a linear image sensor arranged to convert the reflected  
light from the document into an electrical signal corresponding  
to the intensity of the reflected light of the document, and to  
output the electric signal; and

15 a light source drive circuit that is arranged to control a  
number of the high voltage high frequency pulses supplied to  
the light source within one accumulation time of the linear  
image sensor in order to alter an exposure light level of the  
linear image sensor.

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18. A document reading apparatus comprising:

a light source positioned parallel to one side of a  
document and being driven by high voltage high frequency pulses  
25 to irradiate light on the document, a positional relation

between the document and the light source being mechanically changeable so that an irradiated area on the document moves along the other side of the document;

a linear image sensor arranged to convert a reflected  
5 light from the document into an electrical signal corresponding to the intensity of the reflected light of the document, and to output the electric signal; and

a light source drive circuit that is arranged to control a period of the high voltage high frequency pulses supplied to  
10 the light source in order to alter an exposure light level of the linear image sensor.

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19. An imaging apparatus comprising:

a document reading apparatus including a light source for irradiating a document, a linear image sensor for converting reflection light of the document into an electric signal, a  
20 light source drive controller that includes a pulse generating unit for generating a plurality of control pulses having a period that is shorter than an accumulation period of the linear image sensor, the accumulation period being indicated by a timing signal that represents the accumulation period and a  
25 non-accumulation period, and a synchronization output unit for

outputting a prescribed number of trigger pulses in synchronization with the timing signal and control pulses, and a light source driver that is arranged to drive the light source in response to the trigger pulses;

5       an image processing apparatus that is arranged to convert image data output by the document reading apparatus into image output data; and

10      an image reproducing unit that is arranged to reproduce an image of the document on a sheet of paper based on the image output data.

15      20. An imaging apparatus comprising:

a document reading apparatus including a light source for irradiating a document, a linear image sensor for converting reflection light of the document into an electric signal, light source drive control means that includes pulse generating means 20 for generating a plurality of control pulses having a period that is shorter than an accumulation period of the linear image sensor, the accumulation period being indicated by a timing signal that represents the accumulation period and a non-accumulation period, and synchronization output means for 25 outputting a prescribed number of trigger pulses in

synchronization with the timing signal and control pulses, and light source driving means for driving the light source in response to the trigger pulses;

an image processing apparatus that is arranged to convert  
5 image data output by the document reading apparatus into image output data; and

image reproducing means for reproducing an image of the document on a sheet of paper based on the image output data.